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Works by Staff of the Economic Assessment Office and Its Contractors

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Economic Assessment Office

Advanced Technology Program

December 1998



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For copies of completed reports see the Economic Assessment Office webpage
<<http://www.ATP.NIST.GOV>> and select "News, Publications, and Conferences," or
call (301) 975-2064.

Chang, Connie K.N. "A New Lexicon and Framework for Analyzing the Internal Structures of the U.S. ATP and Its Analogues Around the World." The Journal of Technology Transfer. vol. 23(2):67-73, Summer 1998. *This paper constructs a lexicon and an analytical framework with which to understand and make comparisons between various national technology programs. It identifies and discusses a representative sample of important program design features, e.g., eligibility requirements, the nature of the research, technical scope, the selection process, and public-private financial arrangements, and provides examples of national programs embodying alternative design choices.*

Key search words: Advanced Technology Program, foreign technology programs, national technology programs, program design, research, technology policy.

_____, "ATP Eligibility Criteria for U.S. Subsidiaries of Foreign-owned Companies: Legislation, Implementation, and Results." NISTIR 6099 - January 1998. *This report addresses the criteria set forth by Congress that U.S. subsidiaries of foreign-owned companies must meet as a condition of receiving ATP funding. It provides information and statistics on foreign eligibility and participation and can be a useful resource for potential applicants.*

Key search words: Advanced Technology Program, eligibility criteria, foreign participation, technology policy.

CONSAD Research Corporation. "Advanced Technology Program Case Study: The Development of Advanced Technologies and Systems for Controlling Dimensional Variation in Automobile Body Manufacturing." GCR 97-709 - March 1997. *This study of the "2mm project" first investigates the effects of the ATP-sponsored project at the firm level to determine the technological changes that resulted from the project; the role played by the ATP; and the nature of the direct economic impacts that are expected to result from the technological changes. The information obtained in the background investigation is then used to estimate the national economic impacts of the project, omitting at this time possible impacts from future adoption of the technology by user industries other than the automobile industry.*

Key search words: Advanced Technology Program, automobile industry, case study, economic analysis, economic evaluation, economic methodology, technology policy.

Jaffe, Adam B. "Economic Analysis of Research Spillovers: Implications for the Advanced Technology Program." GCR 97-708 - December 1996. *This paper by Jaffe identifies three forms of spillovers that are of particular importance to the ATP; knowledge spillovers, market spillovers, and network spillovers. ATP's task of funding high-social-return projects that would otherwise have been under funded will be facilitated by considering those characteristics that contribute to spillovers. This paper identifies particular characteristics of the market and technological environment that make spillovers more or less likely.*

Key search words: economic analysis, economic evaluation, externalities, market failure, private and social costs and benefits, r&d spillovers, social returns, technology diffusion, technology policy.

Kelley, Maryellen R. "From Mission to Commercial Orientation: Perils and Possibilities for Federal Industrial Technology Policy." *Economic Development Quarterly*, vol. 11, No. 4:313-328, November 1997. *This paper by Kelley examines the new commercial orientation of the U.S. government's post Cold-War technology programs. The Advanced Technology Program initiatives reviewed in this paper signify a change in direction from the strictly military-led, mission-driven approach of the past towards a shared goal of assisting industry in achieving technical advances that provide both private and social benefits to the nation as a whole. This paper concludes that what lies ahead of a new post-cold war technology policy is likely to follow an evolutionary path and a redefinition of the roles and relationships between government and industry.*

Key search words: advanced technology program, economics of science & technology, government-industry relationships, private and social costs and benefits, technology policy.

Kelley, Maryellen R., and Ashish Arora. "The Role of Institution-Building in U.S. Industrial Modernization Programs." *Research Policy*, 25:265-279, (1996). *In this paper Kelley and Arora evaluate over 20 different U.S. industrial modernization programs and their effectiveness in addressing issues of technology adoption. They identify the "institution-building" approach which emphasize inter-firm learning. The government serves as the catalyst for bringing technology developers together with potential users and for providing closer linkages between organizations that are the technology leaders and those that tend to be followers. Kelley and Arora's analysis suggests that those programs which support inter-firm learning opportunities stand a better chance of contending with the underlying problems retarding technology transfer, are more likely to gain acceptability by both technology leaders and followers, and are more likely to garner funds from the private sector.*

Key search words: economic analysis, institutional structure, Manufacturing Extension Partnership, private and social costs and benefits, organizational linkages, technology diffusion, technology policy.

Laidlaw, Frances Jean. "Acceleration of Technology Development by the Advanced Technology Program: The Experience of 28 Projects Funded in 1991." NISTIR 6047 - October 23, 1997. *This study demonstrates that the ATP is helping to overcome two types of economic efficiency problems related to speed to market: (1) the difficulty of obtaining funding at all to undertake long-run, high-risk, enabling technology development; and (2) the difficulty of implementing coordinated, collaborative R&D management practices needed to speed the conduct of R&D and the commercialization of the resulting technology.*

Key search words: acceleration of innovation, Advanced Technology Program, case study, economic efficiency, R&D management practices, speed to market, technology policy.

Link, Albert N. "The Advanced Technology Program Case Study: Early Stage Impacts of the Printed Wiring Board Joint Venture, Assessed at Project End." NIST GCR 97-722 -November 1997. *This report by Link summarizes numerous technical accomplishments of the printed wiring board research joint venture funded by the ATP in 1991, and updates a 1993 study by presenting selected quantitative and qualitative measures of cost savings and early economic impacts of the project. Although the focus of the study is on cost savings from research efficiencies, it also documents early productivity gains from the resulting new technical capabilities.*

Key search words: Advanced Technology Program, case study, economic analysis, economic evaluation, economic efficiency, economic methodology, electronics industry, printed wiring boards, R&D consortia, research joint ventures, technology policy.

Mansfield, Edwin. "Estimating Social and Private Returns from Innovations Based on the Advanced Technology Program: Problems and Opportunities." Unpublished report. January 1996. *The eminent economist Edwin Mansfield prepared this report in which he sought to further his understanding of the ATP and the projects it has funded: to assess the willingness of company award recipients to cooperate directly with him in proposed future work; to determine the availability of data; and to consider the applicability of his previous case study methodology to ATP case studies.*

Key search words: case study, economic analysis, economic evaluation, economic methodology, economics of science & technology, private and social costs and benefits, R&D technology policy, u.s. government technology policy.

Powell, Jeanne. "Small-Firm Experience in the Advanced Technology Program." Unpublished report. June 1998. *This paper assesses plans and progress of high technology small firms funded by the Advanced Technology Program (ATP). Using 1997 data collected through the ATP's Business Reporting System (BRS), the paper examines project goals and expected commercial advantage, strategies for commercialization, collaboration experiences on ATP-funded technologies for small firms funded by the ATP during the period 1993 through 1996. Experiences for small firms are compared with experiences of the population of all organizations funded by the ATP during the same period.*

Key search words: commercialization, economic analysis, economic evaluation, economic methodology, economics of science & technology, R&D technology policy, small firms, statistical analysis, u.s. government technology policy.

_____. "Development, Commercialization, and Diffusion of Enabling Technologies: Progress Report for Projects Funded 1993-1995." NISTIR 6098 - December 1997. *An important component of ATP's economic evaluation plan for tracking project progress and outcomes is the administration of an electronic survey on a regular basis to all project participants funded since 1993. The data from these surveys are compiled in the Business Reporting System (BRS) database. This report by Powell summarizes BRS data covering periods through December 31, 1995, filed by 480 companies in 210 ATP projects, funded in 19 competitions during FY 1993-95. The report provides an overview of pathways to achieving targeted commercial and broader economic goals; a status report of completed R&D; an analysis of commercialization and technology diffusion activities; and analyses of other effects of ATP funding, such as stimulation of R&D collaborations, and increased private sector investment in high risk and enabling R&D.*

Key search words: case study, commercialization, economic analysis, economic evaluation, economic methodology, economics of science & technology, R&D technology policy, small firms, statistical analysis, technology diffusion, u.s. government technology policy.

_____. "The ATP's Business Reporting System: A Tool for Economic Evaluation." The Evolution of Firms and Industries. Helsinki, Finland: Tilastokesus Statistikcentralen Statistics Finland (1997). Unpublished report. June 1996. *This report by Powell describes an electronic survey instrument used for tracking the evolution of projects towards achieving their business and economic goals, part of the core of ATP's program evaluation framework. This comprehensive Business Reporting System (BRS) consists of several parts. At the beginning of the project, project participants report on their planned application areas for the technology and strategies for commercialization. Annually they report on progress towards implementing their commercialization strategies and on short-term economic impacts of the projects, including early sales revenues, shortened R&D cycles, collaboration effects, intellectual property creation, and early job creation. Additional sections of the BRS now under development will focus on the post-ATP funding period, capturing technology commercialization and diffusion. Over the following six-year period, participants will report three times, increasing the emphasis on economic impacts of the ATP-funded technology to the nation.*

For the reporting period ending December 31, 1995, there were nearly 400 organizations in the BRS. Although most of the participants/projects reporting to date are still in the early R&D phases, adequate data is available to: 1) illustrate some of the types of analyses possible, 2) provide a snapshot of commercial opportunities that may be expected to result from the awards portfolio and an approximate time line, 3) give evidence that companies are taking necessary steps for successful future commercialization, 4) provide early indication that the non-proprietary information developed with ATP funding is contributing to a shared knowledge base, and 5) indicate patent filings attributable to the research projects.

Key search words: economic analysis, economic evaluation, economics of science & technology, R&D technology policy, statistical analysis, u.s. government technology policy.

Research Triangle Institute. "Framework for Evaluating the Economic Benefits to the Nation of Medical Technologies Funded by the ATP, with Preliminary Application to Tissue Engineering Projects Funded by ATP from 1990 to 1996." NIST GCR 97-737 - April 1998. *This study by Research Triangle Institute of Research Park, N.C., includes model development for the economic evaluation of medical technologies, plus preliminary application of the model for the analysis of all tissue-engineering projects funded by the ATP from 1990 to 1996. Social, private, and public rates of return on investment are estimated on the basis of a single, near-term use of the multi-use technologies.*

Key search words: Advanced Technology Program, biotechnology, case study, economic analysis, economic evaluation, economic methodology, externalities, healthcare economics, medical technology, private and social costs and benefits, R&D spillovers, social rate of return, technology policy, tissue engineering.

Ruegg, Rosalie T. "The Advanced Technology Program's Evaluation Plan and Progress." 7th International Forum on Technology Management. November 1997. *This paper provides an overview of evaluation methods used by the ATP, while reporting sample findings. It includes a discussion of the EAO data base and provides a listing of completed EAO studies. This report also includes a diagrammatic presentation of "Spillovers."*

Key search words: economic analysis, economic evaluation, economic methodology, economics of science & technology, externalities, R&D spillovers, R&D technology policy, technology diffusion, u.s. government technology policy.

_____. "The Advanced Technology Program, Its Evaluation Plan, and Progress in Implementation." The Journal of Technology Transfer, vol. 23(2):5-10, Summer 1998. *This paper presents an overview of the economic evaluation metrics used by the ATP in undertaking case studies. The paper describes a variety of studies, and identifies the theoretical methodological techniques and theoretical approaches employed.*

Key search words: economic analysis, economic evaluation, economic methodology, economics of science & technology, externalities, r&d spillovers, r&d technology policy, technology diffusion, u.s. government technology policy.

_____. Provided an Introduction for and Edited "Symposium on Evaluating a Public-Private Partnership: The Advanced Technology Program." Journal of Technology Transfer, volume 23, No. 2, Summer 1998. *The Introduction positions the evaluation unit of the ATP, the Economic Assessment Office, within the context of the Government Performance and Results Act (GPRA). The volume contains eight articles on the ATP's evaluation efforts providing examples of case studies as well as evaluation methodological development.*

Key search words: Advanced Technology Program, economic evaluation, public-private partnerships.

_____. "Guidelines for Economic Evaluation of the Advanced Technology Program." NISTIR 5896 - November 1996. *These guidelines are intended as a resource for members of the economic evaluation community who wish to perform economic evaluation studies of the Advanced Technology Program (ATP). To help members of this community frame the performance evaluation problem in the context of the ATP, background information is provided on the program, on its evaluation efforts and accomplishments to date, as well as its evaluation objectives and principal areas of interest. This paper also discusses procedures for submitting and evaluating proposed economic studies of the ATP. The guidelines in no way constitute a solicitation for proposals on evaluation or an obligation to fund any proposals that might be submitted; they are provided to improve the quality and relevancy of evaluation studies, and the efficiency and effectiveness of the ATP/evaluator interface.*

Key search words: Advanced Technology Program, benefit-cost analysis, economic analysis, economic evaluation, economic methodology, economics of science & technology, impact assessment, R&D, technology policy.

_____. "Risk Assessment." The Engineering Handbook. (CRC Press, 1996). *This chapter provides analysts and decision makers an overview of using risk assessment techniques to help make more informed choices in the face of risk. It covers the use of expected value analysis, mean-variance criterion and coefficient of variation, risk-adjusted discount rate technique, certainty equivalent technique, simulation analysis, and decision analysis. Risk assessment is presented as a means of providing decision makers with information about the risk exposure inherent in a given decision, and also with information about their risk attitude.*

Key search words: decision making, economic evaluation, risk, risk attitude, risk exposure.

_____. "Economic Methods." Handbook of Energy Efficiency. (CRC Press, 1997). *This chapter provides a guide to making economically efficient choices among alternatives in designing and sizing devices, components, systems, and structures, and in determining if it is economically efficient to invest in specific energy-related technologies. It explains the appropriate use of various measures of economic*

performance, including net present-value benefits, rates of return, and other measures. It also provides an overview of methods of assessing risks in investment decisions, and it provides guidance on how to structure a benefit-cost evaluation, how to take into account the opportunity cost of capital, adjust for inflation, handle taxes and subsidies, and establish study periods for analysis. These methods and guidance can be applied not only to energy-related investment decisions, but can be used generally in assessing the economic merit of alternative investments in technologies.

Key search words: benefit-cost analysis, economic evaluation, economic measures, methods of evaluation.

Servo, Jenny C. Dawnbreaker. "ATP's Commercialization and Business Planning Guide for the Post-Award Period." Unpublished report. September 1998. *This Guide is a combination text/workbook created for the purpose of increasing the likelihood of commercialization success particularly by small companies which receive funding through the ATP. The intention is that ATP awardees might use this guide from the moment they have been notified of an award through the completion of their project and on into the future. The guide contains a series of "activities" intended to create "cognitive dissonance." In other words, the activities are designed to assist the technology entrepreneur develop useful business habits, as well as to part with misconceptions.*

Key search words: Advanced Technology Program, business plan, commercialization, economic evaluation, technology policy,

Silber, Bonnie. Silber & Associates. "Survey of Advanced Technology Program 1990-1992 Awardees: Company Opinion About the ATP and its Early Effects." NIST GCR 97-707 - February 12, 1996. *The Silber study provides a comprehensive statistical analysis of one critical dimension of the success of the ATP: the assessment of participating organizations concerning their progress in carrying out the R&D projects. The survey included 150 questions and covered all 60 ATP projects initiated between 1990 and 1992, and 125 projects participants. The results indicate that the participants perceive the ATP as enabling and accelerating their progress not only in the R&D phase but also in the application and commercialization of those technologies subsequent to the completion of the ATP project.*

Key search words: Advanced Technology Program, case study, commercialization, evaluation, statistical analysis, survey.

Spender, J-C. "Publicly Supported Non-Defense R&D: the USA's Advanced Technology Program." Science and Public Policy. February 1997, pp. 45-52. *Governments with mixed economies see many reasons to intervene in their private sector's R&D, but the theoretical justifications are hotly debated and poorly researched. The most widely accepted notion is that private R&D has substantial public payoff and that it behooves government to subsidize activities which would otherwise fall victim to failures in the marketplace for public goods. For this reason, like many other*

industrialized countries, the U.S. is experimenting with non-military technology R&D support programs, such as the ATP. This can be illustrated as promoting trajectories through an innovation space formed by partnership between the U.S.'s three institutionally distinct modes of scientific and technological innovation: university research; private enterprise; and, public-sector management of society's public goods.

Key search words: Advanced Technology Program, economics of science & technology, innovation, technology policy.

Solomon Associates. "The Advanced Technology Program, An Assessment of Short-Term Impacts: First Competition Participants." February 1993. *This study represents one of the early steps in the implementation of the ATP's overall program evaluation plan. It is part of the effort to track project developments that are expected to be good indicators of progress towards its long term success. Assessment of the long term economic impacts of the projects was not feasible at the time of this study because the projects were still in the early R&D phase, but short term project results here found that indicate progress towards the program's goals. The purpose of the study was to gather essential data from all first competition awardees after at least one year's participation in the program. The assessment that ensued was designed to address the following issue: what impacts ...beyond achievement of technical milestones...has the ATP award had on each participating organization thus far, and what has changed as a result of the participation in the program over the first year.*

Key search words: Advanced Technology Program, case study, evaluation, R&D, statistical analysis, survey.

Wang, Andrew J. "Key Concepts in Evaluating Outcomes of ATP Funding of Medical Technologies." The Journal of Technology Transfer, 23(2):61-65, Summer 1998. *This paper reviews a framework for evaluating ATP-funded projects in medical technologies. Wang discusses the standard approach to cost-benefit analysis, and explains concepts of economic returns, such as private and social returns, and returns to public investment. For the analysis of benefits of new medical technology, methods from healthcare assessment and concepts such as QALYs and statistical value of life are identified and explained.*

Key search words: cost-benefit analysis, price fatality risks, private and social returns, quality-adjusted life years (QALYs), statistical value of life.

